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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Daniel P. Johnson

Title: GLOBAL EQUATION SOLVER AND OPTIMIZER

Docket No.: H0002678.34215

Serial No.: 10/032,682

Filed: December 28, 2001

Due Date: May 9, 2007

Examiner: Susanna Meinecke-Diaz

Group Art Unit: 3694

MS Appeal Brief - Patents

Commissioner for Patents

P.O. Box 1450

Alexandria, VA 22313-1450

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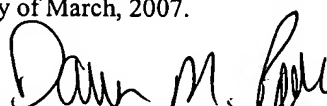
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(GENERAL)



S/N 10/032,682

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Daniel P. Johnson	Examiner:	Susanna Meinecke-Diaz
Serial No.:	10/032,682	Group Art Unit:	3694
Filed:	December 28, 2001	Docket No.:	H0002678.34215
Title:	GLOBAL EQUATION SOLVER AND OPTIMIZER		

REPLY BRIEF UNDER 37 C.F.R. § 41.41

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This Reply is presented in response to the Examiner's Answer, dated March 9, 2007, which was sent in answer to Appellant's Appeal Brief, filed on December 19, 2006. Appellant's Appeal Brief was filed in response to the rejection of claims 1-20 of the above-identified application.

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REPLY

The Examiner's Answer Brief, ("Answer") dated March 9, 2007, includes substantially identical grounds for rejection as the Final Office Action. Appellant respectfully maintains that the Appeal Brief, which is hereby incorporated by reference and reasserted in response, overcomes the grounds of rejection and the arguments put forth in both the Final Office Action and the Examiner's Answer. Notwithstanding, the Applicant further replies in brief as follows.

The Examiner's Answer maintains the rejection of claims 1-20 under 35 U.S.C. § 101, arguing that claims 1-20 are directed to non-statutory subject matter. The Examiner's Answer argues that the claimed invention does not produce a useful, concrete, and tangible result, is directed to a mathematical formula without any specific, substantial, or credible result, and that the mathematical formula is never applied to yield a practical application. The Applicant respectfully disagrees, and in this reply, simply points to the claim language that recites the solving of a "scheduling problem in a particular business operation." The Applicant further respectfully submits that the claims are not directed solely to a mathematical formula, but rather to a statutory process that results in the solving of a scheduling problem in a particular business operation.

The Examiner's Answer maintains the rejection of claims 1-20 under 35 U.S.C. § 112, first and second paragraphs. Regarding the first paragraph rejection, the Examiner's Answer contends that there is no meaningful result produced by the claimed invention. The Applicant respectfully disagrees, and points to the claim language that recites the solving of a "scheduling problem in a particular business operation," by forming and solving "non-convex quadratic equations" and "determining whether a solution to a scheduling problem is optimal, feasible, or infeasible."

The Examiner's Answer maintains the rejection of claims 1-20 under 35 U.S.C. § 102(b). On page 8 of the Examiner's Answer, the Examiner stated that the claimed invention recites various old and well-known optimization techniques in the area of operations research. In the Final Office Action, the Examiner cited the entirety of chapters 1, 3, and 13 of the Hillier reference---chapter 13 of which alone amounts to almost 50 pages. Apparently in response to the Applicant's complaints that this amounted to an omnibus rejection, the Examiner's Answer now

specifically cites pages 571 and 603-606 in chapter 13 of Hillier. The Examiner argues that these pages disclose forming non-convex quadratic equations and solving these non-convex quadratic equations by applying a bound propagation process. The Applicant replies as follows.

Hillier on page 571 states (*bolded emphasis added*):

Nonconvex programming encompasses all nonlinear programming problems that do not satisfy the assumptions of convex programming. Now, even if you are successful in finding a *local maximum*, there is no assurance that it will also be a *global maximum*. Therefore, there is ***no algorithm*** that will guarantee finding an ***optimal solution*** for all such problems.

Further, on page 605, Hillier states (*bolded emphasis added*):

When the assumptions of convex programming are not satisfied, this algorithm¹ should be repeated a number of times by starting from a variety of feasible initial trial solutions. The best of the *local maxima* thereby obtained for the original problem should be used as the ***best available approximation*** of a *global maximum*.

The claims recite forming and solving non-convex quadratic equations, and then determining if a solution is optimal. As can be seen from the above-cited passages of Hillier, in nonconvex programming, before the Applicant's claimed invention, there was no algorithm that would guarantee finding an optimal solution. Moreover, when nonconvex programming was involved, the Sequential Unconstrained Minimization Technique (SUMT) could only provide the best local maximum as a best available approximation of a global maximum. The claimed invention, in stark contrast, provides a method to solve such non-convex quadratic equations, and then determines if the solution to the underlying scheduling problem is optimal. The claims therefore recite the metes and bounds of the invention, particularly claim the novel aspects of the invention, and the specification enables this claimed invention on pages 4-13 of the specification, and in a detailed example on pages 13 – 41 of the specification.

On page 6 of the Examiner's Brief, the Examiner contends that the claims involve variables, relationships, and constraints that are never explicitly defined, and that the claims are

¹ The algorithm being referred to here is the Sequential Unconstrained Minimization Technique (SUMT).

nebulous and abstract in nature. In reply, the Applicant respectfully submits that, as stated in the Applicant's Brief, operators of manufacturing plants are intimately familiar with the variables and constraints associated with the operations of their plants, and are quite able to set up quadratic equations to address such variables and constraints. As further stated in the Applicant's brief, the identification and selection of such variables and constraints are not part of the presently claimed invention. Rather, the presently claimed invention directly addresses a shortcoming of the prior art as specifically outlined in Hillier, that is, in nonconvex programming, even if one is successful in finding a *local maximum*, there is no assurance that it will also be a *global maximum*. As admitted by Hillier, before the Applicant's invention, there was simply no algorithm that would guarantee finding an optimal solution for all such nonconvex programming problems. The Applicant solved this problem of the prior art, and does not claim only the solution to this nonconvex programming problem, but rather claims its method of "solving an operations problem . . . comprising a scheduling problem in a particular business operation," by "forming a set of non-convex quadratic equations," "solving the set of non-convex quadratic equations," and "determining whether the solution to the scheduling problem is optimal."

On pages 10-11, the Examiner repeats the dessert analogy that was used in the Final Office Action. The Applicant once again respectfully submits that the Examiner's dessert example is irrelevant and misleading. The Hillier reference bemoans the inability of the art to optimally solve non-convex programming problems. The Applicant discloses and teaches those of skill in the art how to do this, and claims the method for doing so. To analogize the Applicant's solution to a specific problem in the prior art with a non-analogous example without a corresponding prior art problem is both irrelevant and misleading. The Applicant therefore stands by its assertion that the Examiner's dessert example is improper.

On page 11, the Examiner's Answer states that the Applicant has left too many gaps between deciding which variables, relationships, and constraints to use based on a particular scheduling environment, and determining whether a solution to a scheduling problem is optimal. The Applicant respectfully disagrees, and respectfully submits that it has solved a problem with non-convex programming in the prior art, claims the metes and bounds of that solution, and clearly enables the implementation of that solution in the specification.

In response to the Appellant's contention that its claimed invention is at least as useful, concrete, and tangible as the calculation of a share price in *State Street*, the Examiner argues on page 12 that in *State Street* the claims specifically related to portfolio income, expenses, gain, and loss, and the allocation of this data among each fund in the portfolio, and then argues that these are very concrete factors that are used to effectively produce a share price. The Applicant replies that in response to the shortcoming of the prior art, that is, non-convex programming methods being unable to determine if a solution is optimal, the Appellant is entitled to claim its solution to a non-convex programming problem, as applied to a scheduling problem in a particular business operation, through the use of a bound propagation process, a local linear bounding process, a local linearization process, and a global subdivision search,² and that this is just as useful, concrete, and tangible as the calculation of a share price in *State Street*.

² The Examiner argues that the Applicant has not attempted to address the meaning of "global subdivision search." However, the Final Office Action stated that it would assume that one of the well-known options for a global subdivision search would be used for examination purposes. The Applicant does not object to this assumption, and further contends that it does not negatively affect the patentability of the claims.

Conclusion

The pending claims subject to this appeal are believed patentable. Appellant respectfully submits the claims are in condition for allowance and requests the Board issue an order to withdraw the rejections of claims 1-20.

Respectfully submitted,

DANIEL P. JOHNSON

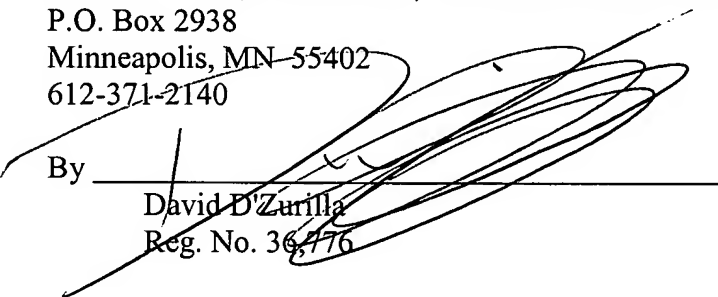
By his Representatives,

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Date

March 22, 2007

By



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